Instruction Bulletin
VD0C06S304E
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ALTIVAR® 66

Adjustable Speed Drive Controllers For Asynchronous Motors

User's Manual

Constant and Variable Torque: 1 to 400 hp, 460 V and 1 to 50 hp, 230 V Receiving, Installation and Start-Up

Telemecanique

SQUARE D

⚠ DANGER

HAZARDOUS VOLTAGE.

- Read and understand this bulletin in its entirety before installing or operating ALTIVAR 66 drive controllers. Installation, adjustment, repair and maintenance of these drive controllers must be performed by qualified personnel.
- Disconnect all power before servicing drive controller. WAIT ONE MINUTE until DC bus capacitors discharge, then measure DC bus capacitor voltage between PA and (-) terminals to verify DC voltage is less than 45 V (see pages 78 through 80). The DC bus LED is not an accurate indication of the absence of DC bus voltage.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Install all covers and close door before applying power or starting and stopping the drive controller.
- User is responsible for conforming to all applicable code requirements with respect to grounding all equipment. For drive controller grounding points, refer to the terminal connection drawings on pages 41, 42, and 43.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Before servicing drive controller:

- Disconnect all power.
- Place a “DO NOT TURN ON” label on drive controller disconnect.
- Lock disconnect in open position.

Failure to follow these instructions will result in death or serious injury.

LIST OF FIGURES

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CHAPTER 1—RECEIVING AND INSTALLATION

INTRODUCTION

ALTIVAR® 66 is a family of 1 to 400 hp, 2.2 to 250 kW, 460 V and 1 to 50 hp, 2.2 to 37 kW, 230 V adjustable frequency AC drive controllers. The 460 V line consists of 19 devices in 7 outlines, the 230 V line consists of 8 devices in 5 outlines. Capable of controlling either constant or variable torque loads and designed to handle simple or complex applications, ALTIVAR 66 drive controllers may function as stand-alone drive controllers or as part of complex drive systems.

The ALTIVAR 66 family also includes optional peripherals. Consult catalog for descriptions.

Scope

This manual covers receiving, installation, and startup of the 460 V and 230 V lines of ALTIVAR 66 drive controllers. It also includes information on diagnostics. For configuration and adjustment of the drive controller parameters, refer to the Level 1 & 2 Configuration manual.

Many options are available for the ALTIVAR 66 drive controller. Refer to the catalog for a description of these options. A manual or instruction sheet is provided with each option.

Documentation List

The following ALTIVAR 66 drive controller documents are available:

- Receiving, Installation, and Start-Up: VD0C06S304_
- Level 1 & 2 Configuration: VD0C06S305_
- Dynamic Braking: VD0C06S908_
- Catalog: VD0C06S201_

Additional documentation is provided with the optional peripherals.

Revision Level

This document, Revision E, replaces VD0C06S304D dated February, 1998.

HAZARD LABELING

The ALTIVAR 66 drive controller is shipped with an English safety label applied to the control board. If a Spanish, German, or French label is required, affix it to the main control board above the English label (see Figure 1). Do not obstruct the English label.

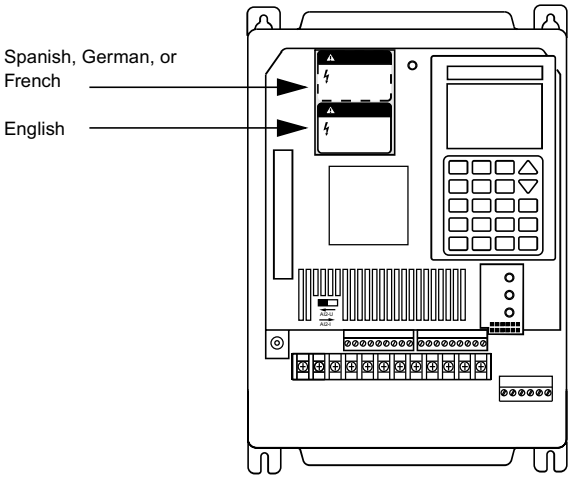


Figure 1: Hazard Labeling

The ATV66C10N4 to ATV66C31N41 drive controllers also ship with a similar English safety label applied to the front door. Affix a Spanish, German, or French label above the English label as required. See Figure 9 and Figure 10.

NAMEPLATES AND SERIAL NUMBERS

For most of the drive controllers, the nameplate is found on the bottom right corner of the right side of the controller. The exceptions are the ATV66C23N41 through C31N41, where the plate is located on the inside of the front door.

Serial numbers are usually found next to the nameplate, except on ATV66D33N4 to D46N4, and ATV66D23M2 to D33M2, where the serial number is in two separate locations. For ATV66C10N4 to C19N4 controllers covered by this manual, there is always a “1” as the seventh digit of the serial number.

Figure 2: Sample Nameplate

The following four figures show the location of nameplates and serial numbers.

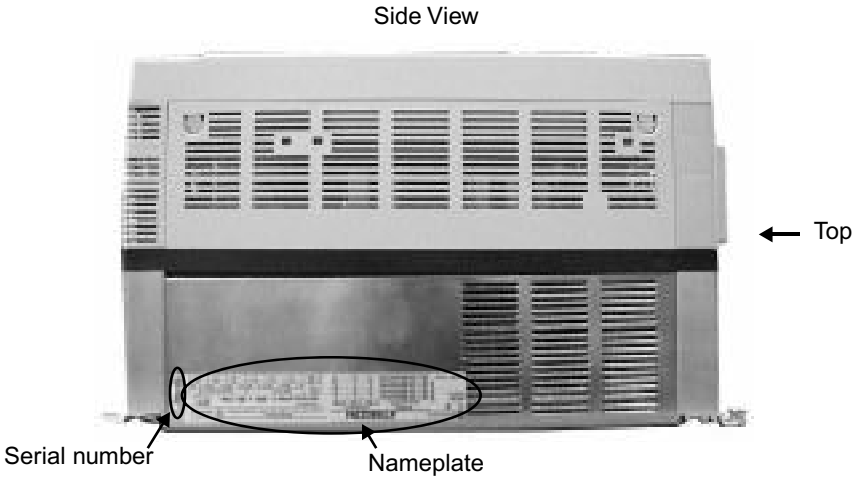


Figure 3: ATV66U41N4 to D23N4 and ATV66U41M2 to ATV66D16M2

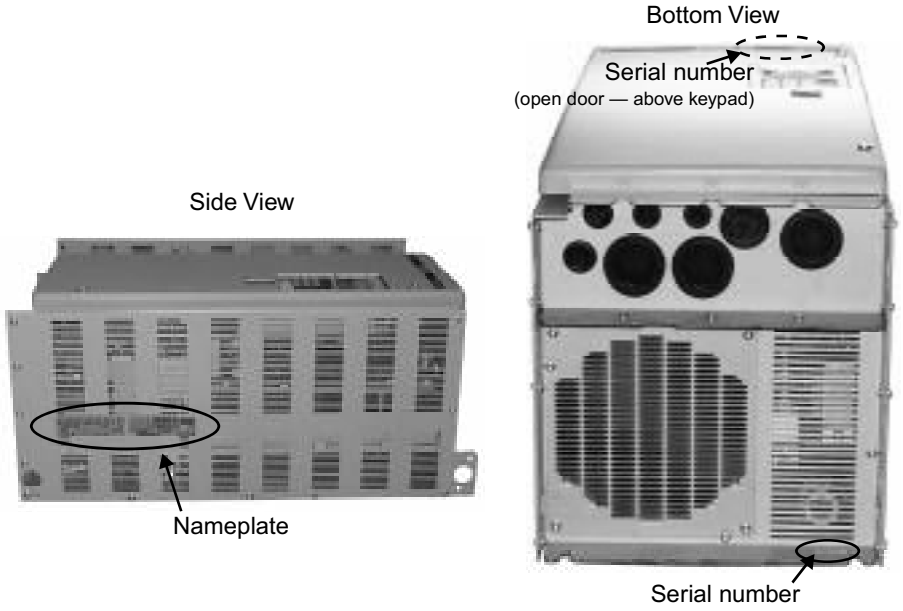


Figure 4: ATV66D33N4 to D79N4 and ATV66D23M2 to D46M2

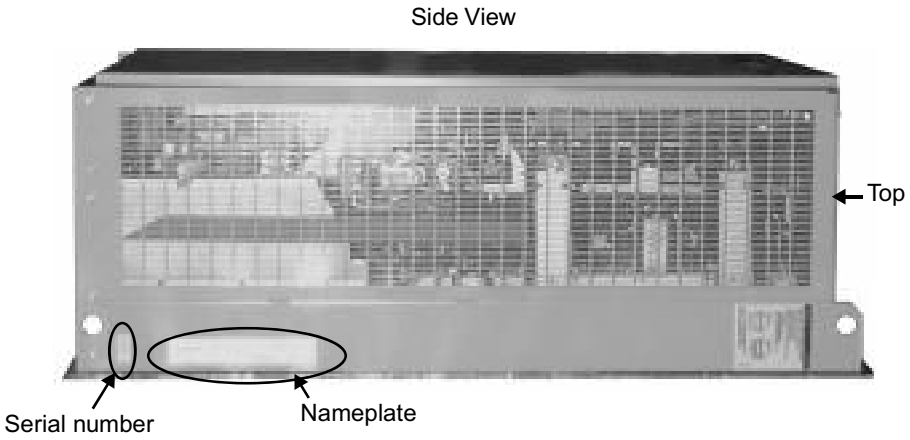


Figure 5: ATV66C10N4 to C19N4

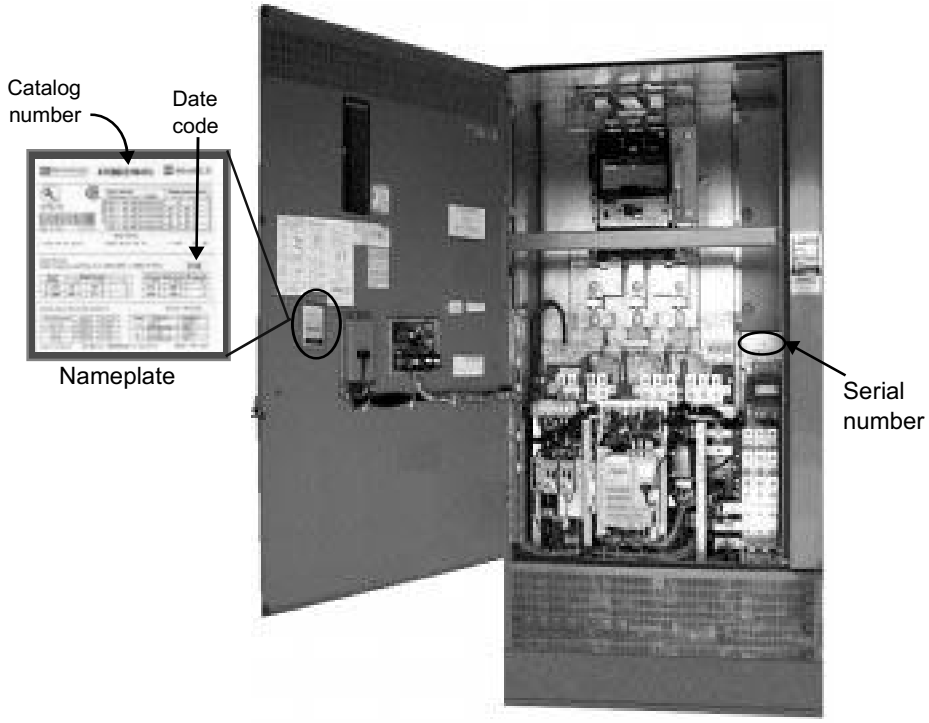


Figure 6: ATV66C23N41 to C31N41

TECHNICAL CHARACTERISTICS

460 V Controllers

The following tables show power and current ratings for 460 V drive controllers when set for constant torque (Table 1); variable torque (Table 2); and variable torque, low noise (Table 3). Table 4 on page 10 lists recommended braking resistance values.

Table 1: Constant Torque Drive Controller Ratings 460 V

400 V ±15% and 460 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41N4 to D46N4 = 4 kHz, ATV66D54N4 to C31N41 = 2 kHz

Outline	Drive Controller Part No.	Motor Power 400 V 50 Hz kW	Motor Power 460 V 60 Hz hp	Output Current A	Max. Transient Current (60 s) A	Total Dissipated Power W
1	ATV66U41N4	0.75	—	2.3	8.0	95.0
		—	1	1.8	7.2	95.0
		1.5	—	4.1	8.0	117
		—	2	3.4	7.2	117
		2.2	—	5.8	8.0	140
		—	3	4.8	7.2	140
	ATV66U54N4	3.0	—	7.8	10.7	165
	ATV66U72N4	4.0	—	10.5	14.2	185
		—	5	7.6	11.4	
2	ATV66U90N4	5.5	—	13	17.7	225
		—	7.5	11	16.5	
	ATV66D12N4	7.5	—	17.6	24.0	290
		—	10	14.0	21.0	
3	ATV66D16N4	11.0	—	24.2	33.0	380
		—	15	21.0	31.5	
	ATV66D23N4	15.0	—	33.0	45.0	530
		—	20	27.0	40.5	
4	ATV66D33N4	22.0	—	48.4	66.0	655
		—	30	40.0	60.0	
	ATV66D46N4	30.0	—	66.0	90.0	880
		—	40	52.0	78.0	
5	ATV66D54N4	37.0	—	79.2	108	885
		—	50	65.0	97.5	
	ATV66D64N4	45.0	—	93.5	127.5	1055
		—	60	77.0	115.5	
	ATV66D79N4	55.0	—	115.5	157.5	1270
		—	75	96.0	144.0	

Table 1: Constant Torque Drive Controller Ratings 460 V (Continued)

400 V ±15% and 460 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41N4 to D46N4 = 4 kHz, ATV66D54N4 to C31N41 = 2 kHz

Outline	Drive Controller Part No.	Motor Power 400 V 50 Hz	Motor Power 460 V 60 Hz	Output Current	Max. Transient Current (60 s)	Total Dissipated Power
		kW	hp	A	A	W
6	ATV66C10N4	75 —	— 100	152 124	207 186	1605
	ATV66C13N4	90 —	— 125	190 156	258 234	1952
	ATV66C15N4	110 —	— 150	226 180	307 270	2251
	ATV66C19N4	132 —	— 200	270 240	367 360	3067
7	ATV66C23N41	160 —	— 250	330 300	450 450	4483
	ATV66C28N41	200 —	— 300	407 360	555 540	5246
	ATV66C31N41	220 —	— 350	449 420	612 630	5966

Table 2: Variable Torque Drive Controller Ratings 460 V

400 V ±15% and 460 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41N4 to D46N4 = 4 kHz, ATV66D54N4 to C31N41 = 2 kHz

Outline	Drive Controller Part No.	Motor Power 400 V 50 Hz kW	Motor Power 460 V 60 Hz hp	Output Current A	Max. Transient Current (60 s) A	Total Dissipated Power W
1	ATV66U41N4	0.75	—	2.0	7.8	90.0
		—	1	1.8	5.3	90.0
		1.5	—	3.7	7.8	110
		—	2	3.4	5.3	110
		2.2	—	5.3	7.8	130
		—	3	4.8	5.3	130
		3.0	—	7.1	7.8	150
	ATV66U54N4	4.0	—	9.5	10.5	180
		—	5	7.6	8.4	
	ATV66U72N4	5.5	—	11.8	13.0	205
		—	7.5	11.0	12.1	
2	ATV66U90N4	7.5	—	16.0	17.6	265
		—	10	14.0	15.4	
	ATV66D12N4	11.0	—	22.0	24.2	350
		—	15	21.0	23.1	
3	ATV66D16N4	15.0	—	30.0	33.0	480
		—	20	27.0	29.7	
	ATV66D23N4	18.5	—	37.0	40.7	560
		—	25	34.0	37.4	
4	ATV66D33N4	30.0	—	60.0	66.0	800
		—	40	52.0	57.2	800
	ATV66D46N4	37.0	—	72.0	79.2	910
		—	50	65.0	71.5	
5	ATV66D54N4	45.0	—	85.0	93.5	960
		—	60	77.0	84.7	
	ATV66D64N4	55.0	—	105	115	1150
		—	75	96.0	105	
	ATV66D79N4	75.0	—	143	151	1400
		—	100	124	136	

Table 2: Variable Torque Drive Controller Ratings 460 V (Continued)

400 V ±15% and 460 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41N4 to D46N4 = 4 kHz, ATV66D54N4 to C31N41 = 2 kHz

Outline	Drive Controller Part No.	Motor Power 400 V 50 Hz kW	Motor Power 460 V 60 Hz hp	Output Current A	Max. Transient Current (60 s) A	Total Dissipated Power W
6	ATV66C10N4	90.0 —	— 125	170 156	187 171	2271
	ATV66C13N4	110 —	— 150	205 180	226 198	2596
	ATV66C15N4	132 —	— 200	245 240	270 264	3246
	ATV66C19 [1]	160	—	300	330	—
7	ATV66C23N41	200 —	— 300	370 360	407 396	5246
	ATV66C28N41	220 —	— 350	408 420	449 462	5966
	ATV66C31N41	250 —	— 400	460 477	506 525	6624

[1] Unit available for 400 V / 50 Hz supply voltage only.

Table 3: Variable Torque, Low Noise Drive Controller Ratings 460 V

400 V ±15% and 460 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41N4 to D46N4 = 10 kHz, ATV66D54N4 to D79N4 = 4 kHz

Outline	Drive Controller Part No.	Motor Power 400 V 50 Hz kW	Motor Power 460 V 60 Hz hp	Output Current A	Max. Transient Current (60 s) A	Total Dissipated Power W
1	ATV66U41N4	0.75 — 1.5 — 2.2 —	— 1 — 2 — 3	2.0 1.8 3.7 3.4 5.3 4.8	5.8 5.3 5.8 5.3 5.8 5.3	90.0 90.0 110 110 130 130
	ATV66U54N4	3.0	—	7.1	7.8	150
	ATV66U72N4	4.0 —	— 5	9.5 7.6	10.5 8.4	180
2	ATV66U90N4	5.5 —	— 7.5	11.8 11.0	13.0 12.1	205
	ATV66D12N4	7.5 —	— 10	16.0 14.0	17.6 15.4	265

Table 3: Variable Torque, Low Noise Drive Controller Ratings 460 V (Continued)

400 V ±15% and 460 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41N4 to D46N4 = 10 kHz, ATV66D54N4 to D79N4 = 4 kHz

Outline	Drive Controller Part No.	Motor Power 400 V 50 Hz kW	Motor Power 460 V 60 Hz hp	Output Current A	Max. Transient Current (60 s) A	Total Dissipated Power W
3	ATV66D16N4	11 —	— 15	22 21	24.2 23.1	350
	ATV66D23N4	15 —	— 20	30 27	33.0 29.7	480
4	ATV66D33N4	22 —	— 30	44 40	48.4 44.0	600
	ATV66D46N4	30 —	— 40	60 52	66.0 57.2	800
5	ATV66D54N4	37 —	— 50	72 65	79.2 71.5	910
	ATV66D64N4	45 —	— 60	85 77	93.5 84.7	960
	ATV66D79N4	55 —	— 75	105 96	115 105	1150

Table 4: Recommended Braking Resistance Values

460 V Drive Controller Part No.	PA/PB Minimum Resistance Ω	460 V Drive Controller Part No.	PA/PB Minimum Resistance Ω
ATV66U41N4	120	ATV66D64N4	5.0
ATV66U54N4	120	ATV66D79N4	5.0
ATV66U72N4	120	ATV66C10N4B [1]	2.5
ATV66U90N4	56	ATV66C13N4B [1]	2.5
ATV66D12N4	56	ATV66C15N4B [1]	2.5
ATV66D16N4	28	ATV66C19N4B [1]	2.5
ATV66D23N4	28	ATV66C23N41	2.0
ATV66D33N4	14	ATV66C28N41	1.25
ATV66D46N4	14	ATV66C31N41	1.25
ATV66D54N4	10		

[1] Refer to page 73 for more information.

208 V and 230 V Controllers

Tables 5 through 7 show the power and current ratings for 208 V and 230 V drive controllers when set for constant torque (Table 5); variable torque (Table 6); and variable torque, low noise (Table 7). Table 8 lists recommended braking resistance values.

Table 5: Constant Torque Drive Controller Ratings, 208 V / 230 V

208 V ±10% and 230 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41M2 to D33M2 = 4 kHz, ATV66D46M2 = 2 kHz

Outline	Drive Controller Part No.	Motor Power 208/230 V 50/60 Hz		Output Current	Max. Transient Current (60 s)	Total Dissipated Power
		kW	hp	A	A	W
1	ATV66U41M2	.75 1.5 2.2	1 2 3	4.0 7.5 10.6	15.9 15.9 15.9	120 140 170
2	ATV66U72M2	4	5	16.7	25.1	239
	ATV66U90M2	5.5	7.5	24.2	36.3	354
3	ATV66D12M2	7.5	10	30.8	46.2	437
	ATV66D16M2	11	15	46.2	69.3	589
4	ATV66D23M2	15	20	59.4	89.1	728
	ATV66D33M2	22	30	88.0	132	1052
5	ATV66D46M2	30	40	114	171	1439

Table 6: Variable Torque Drive Controller Ratings 208 V/230 V

208 V ±10% and 230 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41M2 to D33M2 = 4 kHz, ATV66D46M2 = 2 kHz

Outline	Drive Controller Part No.	Motor Power 208/230 V 50/60 Hz		Output Current	Max. Transient Current (60 s)	Total Dissipated Power
		kW	hp	A	A	W
1	ATV66U41M2	.75 1.5 2.2	1 2 3	4.0 7.5 10.6	15.4 15.4 15.4	120 140 170
2	ATV66U72M2	5.5	7.5	24.2	26.6	302
	ATV66U90M2	7.5	10	30.8	33.9	414
3	ATV66D12M2	11.0	15	46.2	50.8	559
4	ATV66D23M2	15.0	20	59.4	65.3	770
		18.5	25	74.8	82.3	831
	ATV66D33M2	30.0	40	114	125	1260
5	ATV66D46M2	37.0	50	143	157	1528

Table 7: Variable Torque, Low Noise Drive Controller Ratings 208 V / 230 V

208 V ±10% and 230 V ±15%, 50/60 Hz ±5%
Switching Frequency: ATV66U41M2 to D33M2 = 10 kHz, ATV66D46M2 = 4 kHz

Outline	Drive Controller Part No.	Motor Power 208/230 V 50/60 Hz		Output Current	Max. Transient Current (60 s)	Total Dissipated Power
		kW	hp	A	A	W
1	ATV66U41M2	.75 1.5 2.2	1 2 3	4.0 7.5 10.6	11.7 11.7 11.7	125 150 181
2	ATV66U72M2	4.0	5	16.7	18.4	252
	ATV66U90M2	5.5	7.5	24.2	26.6	375
3	ATV66D12M2	7.5	10	30.8	33.9	459
	ATV66D16M2	11.0	15	46.2	50.8	619
4	ATV66D23M2	15.0	20	59.4	65.3	785
	ATV66D33M2	22.0	30	88.0	96.8	1127
5	ATV66D46M2	30.0	40	114	125	1332

Table 8: Recommended Braking Resistance Values

208/230 V Drive Controller Part No.	PA/PB Minimum Resistance Ω
ATV66U41M2	47
ATV66U72M2	18
ATV66U90M2	18
ATV66D12M2	12
ATV66D16M2	9
ATV66D23M2	6
ATV66D33M2	4.5
ATV66D46M2	3

Controller Specifications

Table 9: Specifications

Input voltage	400 V ±15% and 460 V ±15% or 208 V ±10% and 230 V ±15%
Displacement power factor	Approximately 0.96
Input frequency	47.5 to 63 Hz
Output voltage	Maximum voltage equal to input line voltage
Frequency resolution	Drive controller: Input AI1: (High Speed/1,024) Hz [1] Input AI2: (High Speed/512) Hz [1] Keypad display: 0.1 Hz increments Processor: 0.015 Hz increments With Option Board: Option board analog inputs: (High Speed/4096) Hz [1] Serial link: 0.015 Hz increments
Frequency accuracy	±(0.0075 Hz + 0.00005 times High Speed)
Temperature drift [2]	Drive controller: Analog inputs: 3 x 10^{-4} times High Speed/°C typical Keypad display: 7 x 10^{-7} times High Speed/°C maximum With option board: Option board analog inputs: 2.5 x 10^{-5} times High Speed/ °C typical Serial link: 7 x 10^{-7} times High Speed/ °C maximum
Frequency range	ATV66U41N4 to D79N4: 0.1 to 400 Hz (constant torque configuration) ATV66C10N4 to C31N41: 0.1 to 200 Hz (constant torque configuration) ATV66U41N4 to C31N41: 0.1 to 75/90 Hz (variable torque configuration) ATV66U41M2 to D46M2: 0.1 to 400 Hz (constant torque configuration) ATV66U41M2 to D46M2: 0.1 to 75/90 Hz (variable torque configuration)
Torque/overtorque	See page 72.
Speed reference	AI1: 0-10 V AI2: 4-20 mA 0-5 V with switch on control board 0-20 mA, x-20 mA, 20-4 mA with keypad display
Speed regulation	Volts/Hertz control type: determined by motor slip, 3% typical for NEMA B motor Normal or high torque (sensorless flux vector) control type: 1.0% without adjustments 0.5% with optional tachometer
Efficiency	Typically greater than 96%
Reference sample time	10 ms
Ramps	Acceleration: 0.1 to 999.9 seconds Deceleration: 0.1 to 999.9 seconds
Braking to standstill	By DC injection: Automatic for 0.5 s if frequency drops below 1 Hz Manual by external signal
Dynamic braking	By optional resistor (see Dynamic Braking User's Manual) [3]

[1] Resolution limited to processor resolution.
[2] Drive Controller at operating load and temperature.
[3] Refer to page 73.

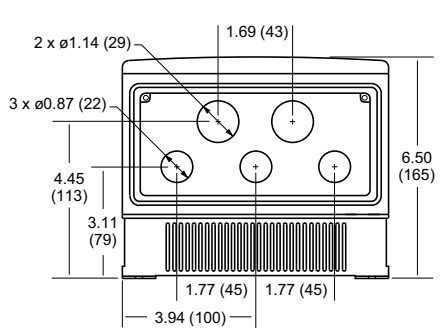
Table 9: Specifications (Continued)

Drive controller protection	Against short circuits: • between output phases • between output phases and ground • on the outputs of internal supplies • on the logic and analog outputs Against input line supply under/overvoltage Against overheating: by thermal sensor
Motor protection	Incorporated electronic thermal protection (page 70)
Keypad display	• Self-diagnostics with full fault messages in six languages • Also refer to Level 1 & 2 Configuration manual
Communication	• Complete programming by keypad • Optional multidrop serial link (Modbus Plus, Modbus, Uni-Telway)
Temperature	Operation: +32 to +104 °F (0 to +40 °C) Storage: -13 to +158 °F (-25 to +70 °C)
Humidity	95% maximum without condensation or dripping water
Altitude	• ATV66U41N4/M2 through ATV66C19N4 ≤ 3,300 ft (1,000 m); above this de-rate by 1.2% for every 300 ft (100 m); max. 6,600 ft (2,000 m) • ATV66C23N41 through ATV66C31N41 ≤ 3,300 ft (1,000 m)
Enclosure	NEMA Type 1 (IP30)
Pollution Degree	Pollution Degree 3 per NEMA ICS-1 and IEC 664-1.
Resistance to vibration	Conforming to IEC 68-2-6: • ATV66U41N4 to D46N4 and ATV66U41M2 to D33M2: 1 mm peak to peak from 5 to 22.3 Hz and 2 g peak from 22.3 to 150 Hz • ATV66D54N4 to C31N41 and ATV66D46M2: 0.15 mm peak to peak from 10 to 58 Hz and 1 g peak from 58 to 150 Hz
Resistance to shock	Conforming to IEC 68-2-27: • 15 g peak for 11 ms
Codes and standards	UL Listed per UL 508C as incorporating electronic overload protection ATV66U41N4 to D79N4 and ATV66U41M2 to D46M2 — UL File E164874, CCN NMMS ATV66C10N4 to C31N41 and ATV66U41M2 to D46M2 — UL File E138755, CCN NMMS CSA certified ATV66U41N4 to D79N4 — CSA File LR96921, Class 3211-06 ATV66C10N4 to C31N41 — CSA File LR 60905, Class 3211-06 CE marked Conforms to applicable NEMA ICS, NFPA, IEC, and ISO 9001 standards

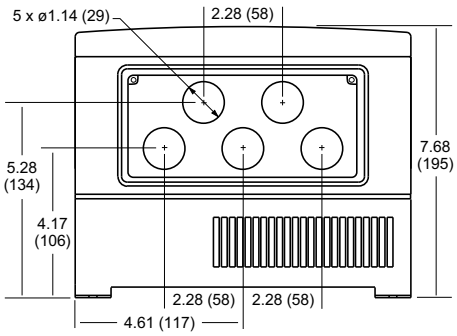
[1] Resolution limited to processor resolution.
[2] Drive Controller at operating load and temperature.
[3] Refer to page 73.

DIMENSION & WEIGHTS FOR WALL OR PANEL MOUNTING

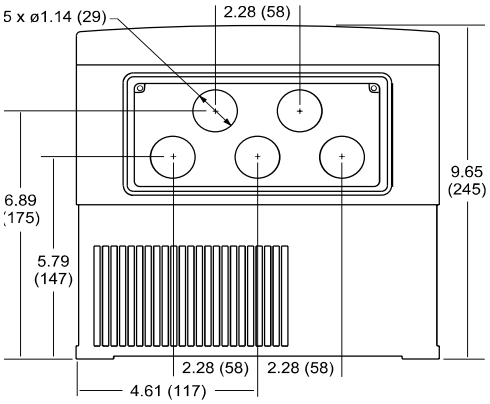
Conduit Entries - Bottom View



Outline 1



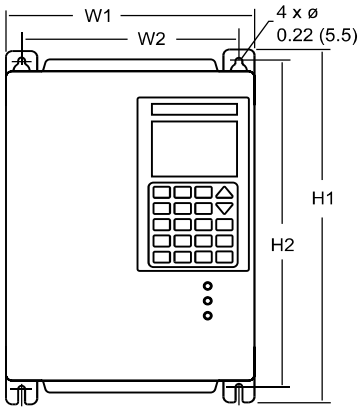
Outline 2



Dimensions:
in (mm)

Outline 3

Mounting



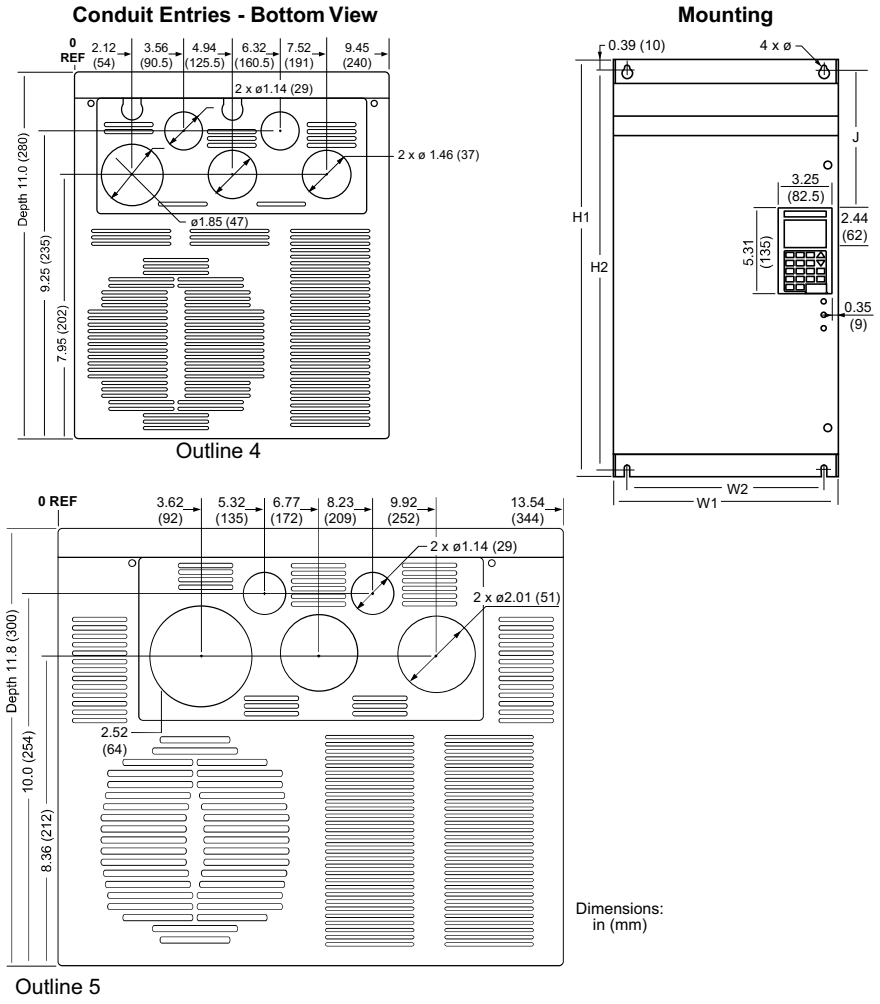
Mounting Dimensions

Outline	Drive Controller ATV66•••N4	Drive Controller ATV66•••M2	H1		H2		W1		W2		Ø		Weight		Door Swing Clearance [1]	
			in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg	in	mm
1	U41 - U72	U41	11.6	295	10.9	280	7.8	200	6.9	175	0.22	5.5	10.4	4.7	7.8	200
2	U90, D12	U72, U90	12.8	325	12.2	310	9.2	234	8.2	209	0.22	5.5	16.1	7.3	9.2	234
3	D16, D23	D12, D16	16.3	415	15.7	400	9.2	234	8.2	209	0.22	5.5	30.9	14	9.2	234

[1] Door hinges on left-hand side of drive controller.

Figure 7: Mounting Information for ATV66U41N4 to D23N4 and ATV66U41M2 to D16M2

NOTE: When metallic conduit is used with drive controllers of outlines 1-3, install a metal conduit entry plate (kit VY1A66201 – separately ordered). Kit mounts in place of the existing plastic plate and has a conduit hole pattern identical to those shown for outlines 1-3.



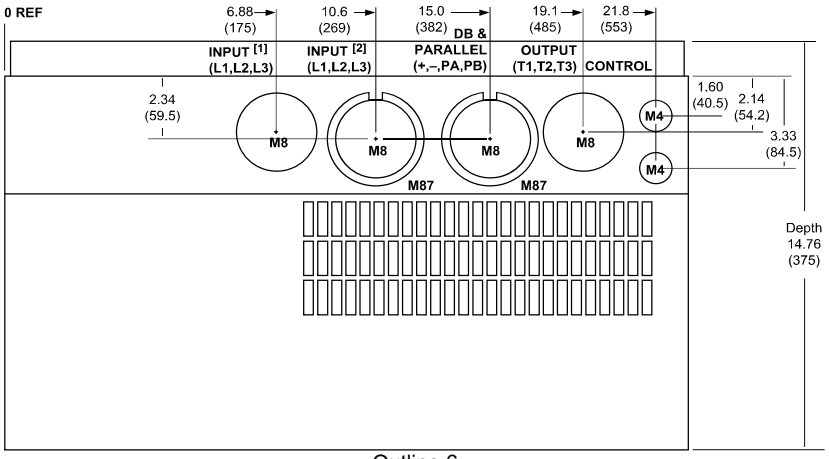
Mounting Dimensions

Outline	Drive Controller ATV66•••N4	Drive Controller ATV66•••M2	H1		H2		W1		W2		Ø		J		Weight		Door Swing Clearance [1]	
			in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg	in	mm
4	D33, D46	D23, D33	23.6	600	22.8	580	9.5	240	8.1	205	0.28	7	3.19	81	59.5	27	9.5	240
5	D54 - D79	D46	25.6	650	24.4	620	13.8	350	11.8	300	0.35	9	3.39	86	88.2 90.4	40 41	13.8	350

[1] Door hinges on left-hand side of drive controller.

Figure 8: Mounting Information for ATV66D33N4 to D79N4 and ATV66D33M2 to D46M2

Conduit Entries - Bottom View



Outline 6

KNOCKOUTS:
M4 = 2 x 1.00 (25.4) dia.
M8 = 2.50 (63.5) dia.
M87 = 3.00 (76.2) dia. w/ 2.50 (63.5) dia.

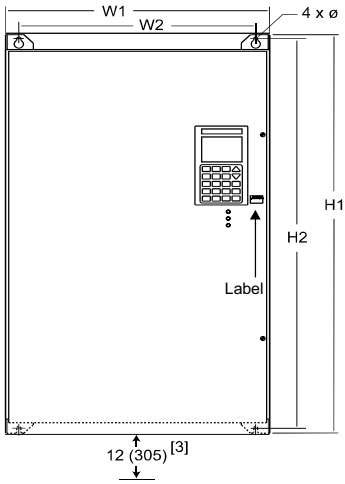
NOTES:

[1] Use 2 in (50.8 mm) knockout for parallel cable runs.

[2] Use single 3 in (76.2 mm) knockout for single cable run.

[3] Leave an area extending 12 in (343 mm) below controller free of obstructions to allow access to ventilation fan.

Mounting



Dimensions: in (mm)

Mounting Dimensions

Outline	Drive Controller ATV66•••N4	H1		H2		W1		W2		Ø		Weight		Door Swing Clearance [1]	
		in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg	in	mm
6	C10 C13, C15, C19	38.6	980	37.7	960	23.0	585	20.8	528	.375	9.5	280 300	127 136	23	584

[1] Door hinges on left-hand side of drive controller.

Figure 9: Mounting Information for ATV66C10N4 to C19N4

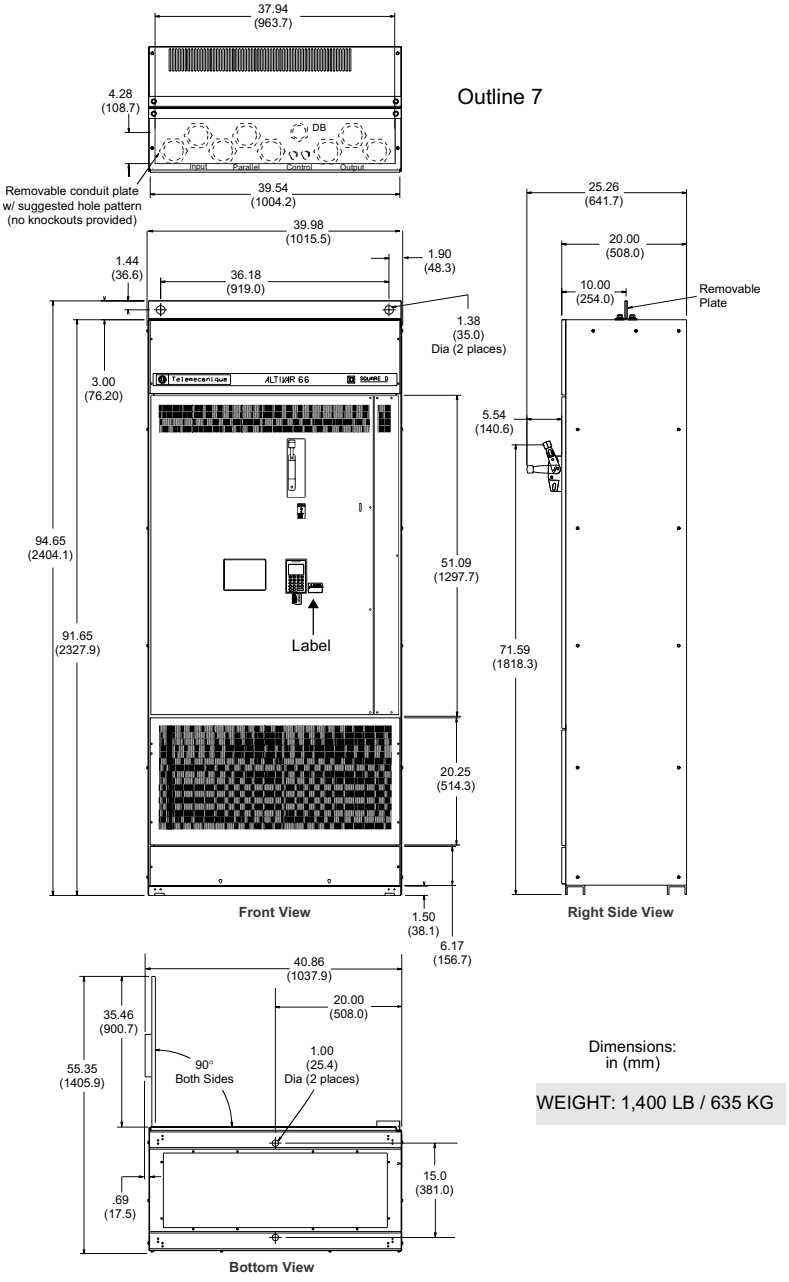


Figure 10: Mounting Information for ATV66C23N41 to C31N41

HANDLING DRIVE CONTROLLERS

It is recommended that the drive controller be kept in its factory carton during storage and transport to the installation site. The carton protects the drive controller and prevents damage to its exterior. Handle the drive controller carefully to avoid damage to the internal components, frame or exterior. When handling a drive controller, balance it carefully to keep it from tipping.

ATV66U41N4 through D46N4 and ATV66U41M2 through D33M2 drive controllers can be removed from their packing and installed manually.

After being removed from the carton or shipping wrap, ATV66D54N4 through C31N41 and ATV66D46M2 drive controllers require some type of mechanical lifting. Handle drive controllers:

- With a hoist, attaching a spreader bar to the two lifting rings on top of the drive controller (see Figure 11) or
- For ATV66D54N4 through C19N4 and ATV66D46M2, in a horizontal position, with back of drive controller resting on a pallet.

⚠ WARNING

HANDLING AND LIFTING HAZARD

Keep area below any equipment being lifted clear of all personnel and property. Use lifting method shown below in Figure 11.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

To hoist the drive controller, attach a spreader bar to the two lifting rings on top of the drive controller, as shown in Figure 11. Handle the drive controller carefully to avoid damage to the internal components, frame or exterior. Place the drive controller in an upright position.

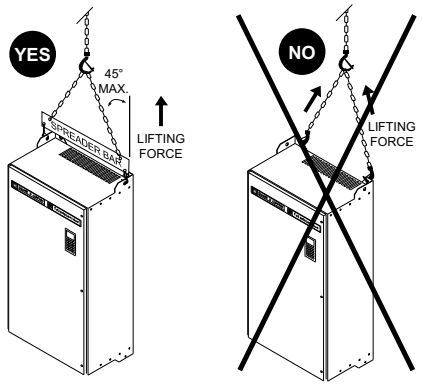


Figure 11: Hoisting ATV66D54N4 to C31N41 and ATV66D46M2

PRELIMINARY INSPECTION

The drive controller must be thoroughly inspected before storing or installing. Upon receipt:

1. Remove the drive controller from its packaging and visually inspect exterior for shipping damage.
2. Check that the drive controller catalog number agrees with the packing slip and corresponding purchase order. The catalog number appears on the drive controller nameplate and shipping package label. Refer to page 3 for location of drive controller nameplate.
3. If you find any shipping damage, notify the carrier and your sales representative.
4. If you will store drive controller after receipt, replace it in original packing material and observe storage temperature specifications on page 14.

Prior to installation:

1. Open the drive controller door or remove access covers.
2. Visually verify that all internal mounting hardware and terminal connection hardware is properly seated, securely fastened, and undamaged.
3. Visually verify that the control board is properly seated, securely fastened, and undamaged. Verify that internal wiring connections are tight. Inspect all connections for damage.
4. Close and secure the drive controller door or replace access covers.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Do not operate or install any drive controller that appears damaged.

Failure to follow this instruction can result in injury or equipment damage.

INSTALLATION PRECAUTIONS

To avoid equipment damage, follow these precautions when installing the drive controller:

- Electrical current through drive controller will result in heat losses that must be dissipated into the ambient air immediately surrounding the drive controller. To prevent thermal fault or equipment damage, provide sufficient enclosure cooling and/or ventilation to limit the ambient temperature around drive controller to a maximum of 40 °C. For power dissipation, refer to Tables 1 to 3 and Tables 5 to 7 on pages 6 - 12. Figure 12 on page 21 shows the minimum clearances required around the drive controller for

unobstructed air flow. For proper thermal dissipation, do not base the minimum enclosure size on clearances alone. Refer to section “Mounting in General-Purpose Metal Enclosure” on page 23 for additional information.

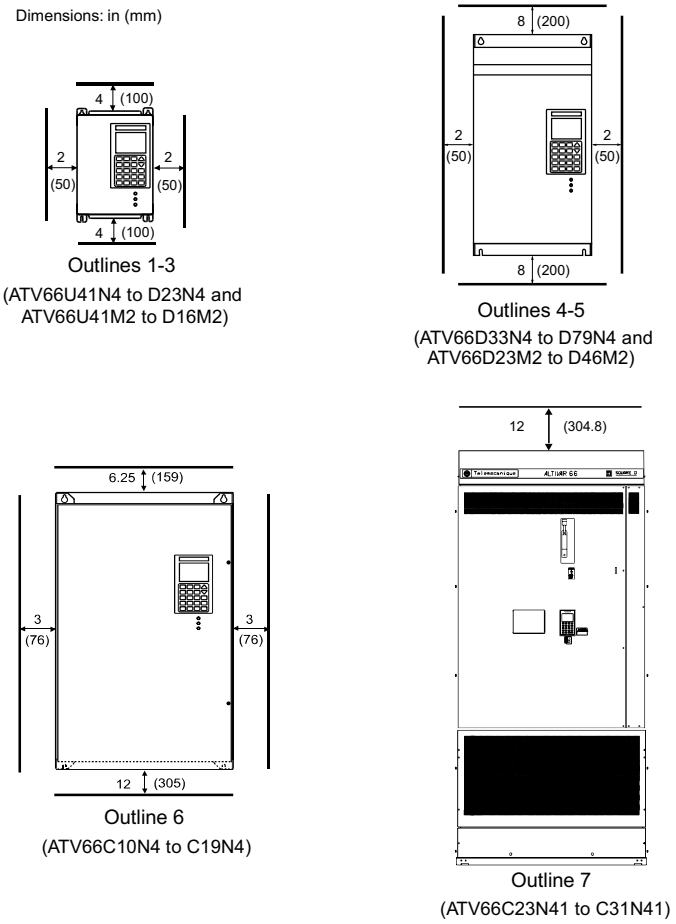


Figure 12: Clearances for Drive Controllers

- Mount drive controller vertically.
- Do not locate drive controller near heat radiating elements.
- When installation surface is uneven, put a spacer behind the drive controller mounting pads to eliminate gaps. The drive controller exterior may be damaged if fastened to an uneven surface.

- Drive controllers are Type 1 enclosed devices and must be installed in a suitable environment. The environment around drive controller must not exceed Pollution Degree 3 requirements as defined in NEMA ICS 1 or IEC664.
- Verify that the voltage and frequency characteristics of the input line match the drive controller nameplate rating.
- Installation of a disconnect switch between the input line and drive controller is recommended. Follow national and local codes.
- Overcurrent protection is required. Install line power fuses (F1-F3) recommended in Tables 21 through 24, starting on page 59.
- Turn off all power before installing the drive controller. Place a “DO NOT TURN ON” label on the drive controller disconnect. Before proceeding with installation, lock the disconnect in the open position.
- The ATV66U41N4 to ATV66C19N4 and ATV66U41M2 to ATV66D46M2 drive controllers may be mounted inside another enclosure to increase the degree of protection or size of the enclosure. See “Mounting in General-Purpose Metal Enclosure” on page 23 or “Mounting in Type 12 (IP54) Metal Enclosure” on page 24.
- To improve ventilation, remove the front cover when mounting the drive controller in an enclosure. For ATV66U41N4 to D23N4 and ATV66U41M2 to ATV66D16M2 drive controllers, remove the front cover by first opening the cover, then separating the retaining clips on the cover from the side panel. For ATV66D33N4 to D79N4 and ATV66D23M2 to ATV66D46M2 drive controllers, remove the front cover by first opening the cover, then lifting it vertically. For ATV66C10N4 to C19N4 drive controllers, remove the front cover by removing the 3 hinge fastening bolts. For ATV66C23N41 to C31N41 drive controllers, there are no removable covers.
- With the front cover removed, the ATV66U41N4 to D79N4 and ATV66U41M2 to ATV66D46M2 drive controllers have an IP20 enclosure rating and the ATV66C10N4 to C19N4 drive controllers have an IP00 enclosure rating.
- For ATV66C10N4 to C31N41 drive controllers, the protective switch (see Figure 41 on page 86 and Figure 42 on page 87) may have tripped during transit. Reset before applying power (Breaker On/Start). Failure to validate may inhibit proper power up of the drive controller.
- The solid state switches of the drive controller power circuit do not provide complete isolation from the line. Leakage currents and voltages may be present at the U/T1, V/T2, and W/T3 terminals of the drive controller whenever power is present.

MOUNTING IN GENERAL-PURPOSE METAL ENCLOSURE

The ALTIVAR 66 drive controller is a Type 1/IP30 enclosed product. However, certain application considerations may require that the drive controller be installed inside a larger enclosure. If so, observe the following precautions:

Ventilation

Forced air cooling is provided on all drive controllers. A fan is located in the bottom of the drive controller (see Figure 13) and is protected by a perforated cover. The fan draws in ambient air from underneath or from the front of the enclosure over the heat sink fins, and expels it vertically from the top of the enclosure. When mounting the drive controller, be sure the air inlets and outlets are not obstructed.

- Follow the installation precautions on pages 20 through 22.
- Observe minimum clearance distances as indicated in Figure 12.
- If the enclosure does not provide sufficient free air flow, an enclosure ventilation fan is required to exhaust the heat to the enclosure outside ambient. The enclosure fan should have a greater fan flow rate than the drive controller fan flow rate listed in Table 10 on page 24.
- If there is a possibility of condensation, keep the control supply switched on during periods when the motor is not running or install thermostatically controlled strip heaters.

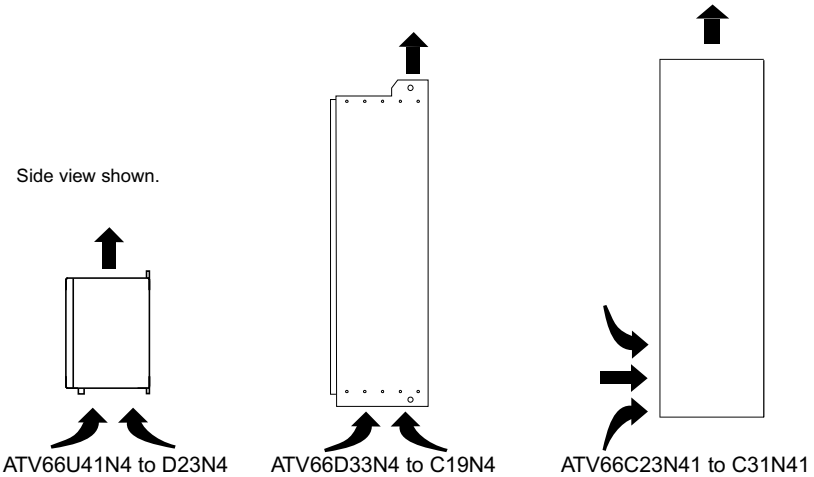


Figure 13: Ventilation for ATV66U41N4 to C31N41 and ATV66U41M2 to D46M2

Table 10: Flow Rates for ALTIVAR 66 Drive Controller Fans

Drive Controller	Fan Flow Rate [1]	
	CFM	dm^3/s
ATV66U41N4, ATV66U54N4	10	5
ATV66U72N4, ATV66U41M2	20	10
ATV66U90N4, ATV66D12N4, ATV66U72M2, ATV66U90M2	44	22
ATV66D16N4, ATV66D23N4, ATV66D12M2, ATV66D16M2	94	47
ATV66D33N4, ATV66D46N4, ATV66D54N4, ATV66D64N4, ATV66D79N4, ATV66D23M2, ATV66D33M2, ATV66D46M2	200	100
ATV66C10N4, ATV66C13N4, ATV66C15N4, ATV66C19N4	500	250
ATV66C23N41, ATV66C28N41, ATV66C31N41	1000	500

[1] Free air flow rates.

If an overtemperature condition occurs:

- The fault LED illuminates, and a fault message appears on the keypad display.
- The ventilation system continues operating if control supply is maintained, enabling the drive controller to cool rapidly.

For ATV66D16N4 to C31N41 and ATV66D12M2 to D46M2 drive controllers, the yellow pre-alarm LED flashes when the drive controller approaches the thermal limit. When the drive controller is running at rated load, and the thermal limit is reached, the drive controller will fault after a minimum one-minute pre-alarm warning.

Additional thermal protection of ATV66C10N4 - C31N41 drive controllers is provided. High-temperature switches are attached to the heat sink and other key components. When one of the switches opens, an immediate protective trip occurs.

MOUNTING IN TYPE 12 (IP54) METAL ENCLOSURE

Although the ALTIVAR 66 drive controller is a Type 1/IP30 enclosed product, certain applications may require Type 12 or IP54 protection. Two types of recess mounting kits are available for mounting drive controller with the heat sink outside the enclosure (see page 26).

Calculating Non-Ventilated Enclosure Size

Use the following equation to calculate Rth (° C/W), the maximum allowable thermal resistance of the enclosure:

$$Rth = \frac{T_i - T_o}{P}$$

T_i = Max. internal ambient temp. (° C) around drive controller = 40 °C

T_o = Max. external ambient temp. (° C) around enclosure

P = Total power dissipated in enclosure (W)

For the power dissipated by the drive controllers at rated load, see Table 1 on page 6, Table 2 on page 8, Table 3 on page 9, Tables 5 and 6 on page 11, and Table 7 on page 12.

Useful heat exchange surface area, S (in^2), of a wall-mounted enclosure generally consists of the sides, top, and front. Use the following equation to calculate the minimum surface area required for a drive controller enclosure:

$$S = \frac{K}{Rth}$$

Rth = Thermal resistance of the enclosure (calculated previously)

K = Area restivity of enclosure material (consult enclosure manufacturer)

Consider these points when sizing the enclosure:

- Use only metallic enclosures because they have good thermal conduction.
- Do not install enclosures where external heat sources (such as direct sunlight) can add to enclosure heat load. This procedure does not consider radiant or convected heat load from external sources.
- Consider the heat load of additional devices present inside the enclosure.
- Use a mounting method that allows air to move freely over all surfaces that are convection cooled. The actual useful area for convection cooling of the enclosure will vary depending upon the method of mounting.

The following example calculates enclosure size for an ATV66U72N4 (5 hp CT) drive controller mounted in a Type 12 enclosure.

- Maximum external temperature: T_o = 25 °C
- Power dissipated inside enclosure: P = 185 W (from Table 1)
- Maximum internal temperature: T_i = 40 °C
- Area resistivity for painted metal: K = 300
- Maximum allowable thermal resistance, R_{th}, calculated by formula:

$$Rth = \frac{40° C - 25° C}{185 W} = 0.081 °C/W$$

- Minimum useful heat exchange surface area, S, calculated by formula:

$$S = \frac{300}{0.081} = 3700 in^2$$

Useful heat exchange surface area (S) of the proposed wall-mounted enclosure:

- Height: 40 in (1016 mm)
- Width: 40 in (1016 mm)
- Depth: 20 in (508 mm)

$$S = \underset{\text{front area}}{(40 \times 40)} + \underset{\text{top area}}{(20 \times 40)} + 2\underbrace{(40 \times 20)}_{\text{side area}} = 4000 \text{ in}^2$$

If the selected enclosure does not provide the required surface area or does not meet application needs, consider the following:

- Use a larger enclosure.
- Use one of the recess mounting kits (ATV66U41N4 to D23N4 and ATV66U41M2 to D16M2 drive controllers). Refer to Table 11 on page 27.
- Add a passive heat exchanger to the enclosure.
- Add an air conditioning unit to the enclosure.
- Consult enclosure manufacturer.

Ventilation

When the drive controller is mounted inside a Type 12 or IP54 enclosure, observe the following ventilation precautions:

- Observe minimum clearance distances shown in Figure 12 on page 21.
- Follow the installation precautions on pages 20 through 22.
- Use a stirring fan, if necessary, to circulate the air inside the enclosure, prevent hot spots in the drive controller, and distribute the heat uniformly to convection-cooled surfaces.
- If there is a possibility of condensation, keep the control supply switched on during periods when the motor is not running or install thermostatically controlled strip heaters.

Recess Mounting

To reduce power dissipated in an enclosure, ATV66U41N4 to D23N4 and ATV66U41M2 to D16M2 drive controllers may be recess mounted in a wall of the enclosure, with the heat sink on the outside. Recess mounting requires a cutout in the enclosure and a recess mounting kit. Using this kit dissipates the majority of the drive controller heat load outside the enclosure.

The power dissipated in the enclosure (P_i) must be dissipated by the available surface area of the enclosure. The heat sink assembly, which is mounted

outside the enclosure, is rated for Type 12/IP54 protection when used with this kit.

There are two types of recess mounting kits: the Gasket Kit, which contains only the gasket necessary for recess mounting, and the Mounting Adaptor Plate Kit, which provides mounting plates along with gaskets. The gaskets in the Mounting Adaptor Plate Kit allow you to assemble the drive controller to the plates before bolting the assembly into the enclosure. This process aids in installation and maintenance of the drive controller.

Table 11: Recess Mounting Kits

Gasket Kit	Mounting Adaptor Plate Kit	Drive Controller	P_i [1] (W)
VW3-A66801T	VW3-A66806	ATV66U41N4 ATV66U54N4 ATV66U72N4 ATV66U41M2	70
VW3-A66802T	VW3-A66807	ATV66U90N4 ATV66D12N4 ATV66U72M2 ATV66U90M2	75
VW3-A66803T	VW3-A66808	ATV66D16N4 ATV66D23N4 ATV66D12M2 ATV66D16M2	110 130 110 130

[1] P_i = power dissipated in the enclosure by a recess-mounted drive controller.

CHAPTER 2—WIRING

WIRING

General Wiring Practices

Good wiring practice requires the separation of control circuit wiring from all power (line and load) wiring. Power wiring to the motor must have the maximum possible separation from all other power wiring, whether from the same drive or other drives. **Do not run in the same conduit;** this separation reduces the possibility of coupling electrical noise between circuits.

When wiring ALTIVAR® 66 drive controllers, follow the wiring practices required by national and local electrical codes in addition to the following:

- When using metallic conduit with ATV66U41N4 to D23N4 and ATV66U41M2 to D16M2 drive controllers, you must also use a metal conduit entry plate, kit VY1A66201. This kit mounts in place of the existing plastic plate and is held in place with two screws. A bond wire, which must be connected to ground (GND) on the J2 terminal strip, is included.
- Use metallic conduit for all drive controller wiring. Do not run control and power wiring in the same conduit.
- Separate metallic conduits carrying power wiring or low-level control wiring by at least 3 in (8 cm).
- Separate non-metallic conduits or cable trays used to carry power wiring from metallic conduit carrying low-level control wiring by at least 12 in (30.5 cm).
- Cross the metallic conduits and non-metallic conduits at right angles whenever power and control wiring cross.
- Attenuate conducted emissions to the line from the drive controller in some installations to prevent interference with telecommunication, radio, and sensitive electronic equipment. Such instances may require attenuating filters. Consult catalog for selection and application of these filters.

Branch Circuit Connections

⚠ WARNING

OVERCURRENT PROTECTIVE DEVICES MUST BE PROPERLY COORDINATED

- To achieve published fault withstand current ratings, install the specified fuses listed on the drive controller nameplate and in Tables 21 through 25.
- Do not connect drive controller to power feeder whose short circuit capacity exceeds drive controller withstand fault rating listed on drive controller nameplate.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

All ALTIVAR 66 drive controllers require fuse protection. ATV66U41N4 to D79N4 and ATV66U41M2 to D46M2 drive controllers require user-supplied external fuses as indicated on the nameplate; in Table 21 on page 59; and in

Table 24 on page 62. ATV66C10N4 to C19N4 drive controllers have provisions for mounting the user-supplied fuses internally (refer to the controller nameplate or Table 22 on page 60 for recommended fuses). ATV66C23N41 to C31N41 drive controllers are shipped with fuses. See page 64 for information on mounting and replacing fuses in ATV66C10N4 to ATV66C31N41 drive controllers.

Refer to NEC Article 430 for sizing branch circuit conductors.

All branch circuit components and equipment (such as transformers, feeder cables, disconnect devices, and protective devices) must be rated for the input current of the ALTIVAR 66 drive controller, not the motor full load current. The input current of the controller depends on impedance of the power distribution system and available fault current at the drive input terminals. The controller input current is stamped on the nameplate (see Figures 3 - 6 for nameplate location).

Select the input current corresponding to the available fault current capability or the line impedance present. If the branch circuit available fault current capability is limited by fuses or circuit breakers (not system impedance), use the available fault current capability on the line side of the fuses or circuit breakers to select the drive controller input current. Tables 12 - 17 provide input current information to optimally size branch circuit conductors.

Line reactors can be used to add reactance to the branch circuit. Line reactors are not recommended if the branch circuit inductance (as shown in the heading of Tables 12 - 17 for each AIC rating) exceeds 100% of the inductance value calculated for a 3% line impedance or exceeds 20% of the inductance value calculated for a 5% line impedance. Excessive impedance may shift input voltage out of the tolerance of the drive controller rating. Line reactors can be used to minimize drive controller input line current, and reduce controller nuisance tripping due to transient overvoltage. If line reactors are used:

- the input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.
- in systems that use bypass contactors, the line reactor should always be connected between the L1, L2, and L3 terminals on the controller and the line fuses. A line reactor in a bypass motor starting circuit will reduce the ability of the motor to produce starting torque.
- the voltage tolerance at input of the reactor will be different from that of the drive controller due to the voltage drop across the line reactor. Voltage tolerance measured at input terminals of the drive controller will be as specified in this manual.
- the line reactor can also improve a phase-to-phase voltage imbalance.

The input line current ratings listed in Tables 12 - 17 for 3% and 5% line reactance are based on coordinated ratings. To calculate the necessary

minimum line reactance, use the following formula to verify the selection of the minimum reactor impedance needed for installation:

$$L = \frac{V_{L\text{-}L} \times \%Z \times 10}{I_{fund} \times \sqrt{3} \times 2\pi \times f}$$

L = inductance, in millihenries (mH)
$V_{L\text{-}L}$ = input voltage measured line to line (utilization voltage)
%Z = desired input impedance rating in percent
I_{fund} = drive controller output current rating
π = Pi constant (3.14)
f = fundamental line frequency (50 or 60 Hz)

Example:

User has a 7.5 hp, 11 A at 460 V/60 Hz motor in combination with ATV66U90N4U (7.5 hp @ 460 V, 11 FLA) drive controller. Calculate the minimum line reactance of a nominal 3% reactor:

$V_{L\text{-}L}$ = 460 V (utilization voltage)
%Z = 3 (3% rated line reactor)
I_{fund} = 11*A* (controller rated output)
f = 60 Hz (fundamental line frequency)

$$L = \frac{460\ V \times 3 \times 10}{11A \times \sqrt{3} \times 2\pi \times 60\ Hz} = 1.9213\ mH$$

Select a line reactor that has a minimum inductance rating (per phase) greater than or equal to 1.9213 mH. None of the branch circuit inductance values of Tables 12 - 14 exceed 1.9 mH.

Table 12: Input Line Currents for Selecting Branch Circuit Conductors, 460 V CT

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power		Drive Controller	Output Current	Input Line Current				
				5,000 AIC 0.141 mH 10,000 AIC [1] 0.070 mH 18,000 AIC [2] 0.039 mH	22,000 AIC 0.032 mH	65,000 AIC 0.011 mH	With Line Impedance of	
kW 400V 50 Hz	hp 460V 60 Hz						3%	5%
			A	A	A	A	A	A
0.75	—	ATV66U41N4	2.3	—	4.0	—	—	—
—	1		1.8	2.7	3.2	3.5	1.6	1.5
1.5	—		4.1	—	3.5	—	—	—
—	2		3.4	4.7	5.7	6.4	3.0	2.7
2.2	—		5.8	—	9.0	—	—	—
—	3		4.8	6.5	8.0	8.8	4.2	3.9
3	—	ATV66U54N4	7.8	—	12	—	—	—
4	—	ATV66U72N4	10.5	—	15.0	—	—	—
—	5		7.6	9.8	11.9	13.2	6.7	6.2
5.5	—	ATV66U90N4	13	—	20.0	—	—	—
—	7.5		11	13.9	16.7	18.5	10.0	9.2
7.5	—	ATV66D12N4	17.6	—	26.0	—	—	—
—	10		14.0	17.6	21.4	24.7	13.0	12.0

[1] 10,000 AIC denoted by asterisk (*).
[2] 18,000 AIC denoted by (†).

Table 12: Input Line Currents for Selecting Branch Circuit Conductors, 460 V CT (Continued)

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power		Drive Controller	Output Current	Input Line Current				
				5,000 AIC 0.141 mH 10,000 AIC [1] 0.070 mH 18,000 AIC [2] 0.039 mH	22,000 AIC 0.032 mH	65,000 AIC 0.011 mH	With Line Impedance of	
kW 400V 50 Hz	hp 460V 60 Hz						3%	5%
			A	A	A	A	A	A
11	—	ATV66D16N4	24.2	—	35.0	—	—	—
—	15		21.0	24.8	29.9	33.6	19.4	17.9
15	—	ATV66D23N4	33.0	—	45.0	—	—	—
—	20		27.0	31.9	38.7	44.8	26.0	23.6
22	—	ATV66D33N4	48.4	—	60.0	—	—	—
—	30		40.0	44.0	52.4	59.7	37.0	34.2
30	—	ATV66D46N4	66.0	—	78.0	—	—	—
—	40		52.0	57.1	67.6	76.6	49.0	45.6
37	—	ATV66D54N4	79.2	—	94.0	—	—	—
—	50		65.0	68.3	80.8	91.9	61.2	56.3
45	—	ATV66D64N4	93.5	—	110	—	—	—
—	60		77.0	86.4*	94.6	108	71.6	66.7
55	—	ATV66D79N4	115.5	—	130	—	—	—
—	75		96.0	106*	116	133	90.1	83.5
75	—	ATV66C10N4	157	—	171	—	—	—
—	100		124	138*	151	173	121	113
90	—	ATV66C13N4	190	—	198	—	—	—
—	125		156	166*	186	211	153	143
110	—	ATV66C15N4	226	—	237	—	—	—
—	150		180	191*	217	246	182	170
132	—	ATV66C19N4	270	—	275	—	—	—
—	200		240	242*	277	314	238	223
160	—	ATV66C23N41	330	—	326	—	—	—
—	250		300	318†	333	379	295	276
200	—	ATV66C28N41	407	—	399	—	—	—
—	300		360	366†	379	441	352	328
220	—	ATV66C31N41	449	—	421	—	—	—
—	350		420	419†	431	506	410	383

[1] 10,000 AIC denoted by asterisk (*).
[2] 18,000 AIC denoted by (†).

Table 13: Input Line Currents for Selecting Branch Circuit Conductors, 460 V VT

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power		Drive Controller	Output Current	Input Line Current				
				5,000 AIC 0.141 mH 10,000 AIC [1] 0.070 mH 18,000 AIC [2] 0.039 mH	22,000AIC 0.032 mH	65,000 AIC 0.011 mH	With Line Impedance of	
kW 400V 50 Hz	hp 460V 60 Hz						3%	5%
			A	A	A	A	A	A
0.75	—	ATV66U41N4	2.0	—	4.0	—	—	—
—	1		1.8	2.7	3.2	3.5	1.6	1.5
1.5	—		3.7	—	6.5	—	—	—
—	2		3.4	4.7	5.7	6.4	3.0	2.7
2.2	—		5.3	—	9.0	—	—	—
—	3		4.8	6.5	8.0	8.8	4.2	3.9
3	—		7.1	—	12.0	—	—	—
4	—	ATV66U54N4	9.5	—	16.0	—	—	—
—	5		7.6	9.8	11.9	13.2	6.7	6.2
5.5	—	ATV66U72N4	11.8	—	20.0	—	—	—
—	7.5		11.0	14.0	17.0	18.4	10.0	9.2
7.5	—	ATV66U90N4	16.0	—	25.0	—	—	—
—	10		14.0	17.7	21.4	23.4	13.0	12.0
11	—	ATV66D12N4	22.0	—	36.0	—	—	—
—	15		21.0	25.1	30.6	35.3	19.4	17.9
15	—	ATV66D16N4	30.0	—	45.0	—	—	—
—	20		27.0	31.8	38.3	42.9	26.0	23.6
18.5	—	ATV66D23N4	37.0	—	57.0	—	—	—
—	25		34.0	38.7	47.0	54.6	31.1	30.1
30	—	ATV66D33N4	60.0	—	79.0	—	—	—
—	40		52.0	57.1	67.6	76.6	49.0	45.6
37	—	ATV66D46N4	72.0	—	94.0	—	—	—
—	50		65.0	68.6	81.2	91.9	61.2	56.3
45	—	ATV66D54N4	85.0	—	112	—	—	—
—	60		77.0	86.4*	94.6	108	71.6	66.7
55	—	ATV66D64N4	105	—	130	—	—	—
—	75		96.0	106*	116	133	90.1	83.5
75	—	ATV66D79N4	143	—	176	—	—	—
—	100		124	138*	150	171	121	113
90	—	ATV66C10N4	190	—	199	—	—	—
—	125		156	165*	185	210	153	143

[1] 10,000 AIC denoted by asterisk (*).
[2] 18,000 AIC denoted by (†).

Table 13: Input Line Currents for Selecting Branch Circuit Conductors, 460 V VT

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power		Drive Controller	Output Current	Input Line Current				
				5,000 AIC 0.141 mH 10,000 AIC [1] 0.070 mH 18,000 AIC [2] 0.039 mH	22,000AIC 0.032 mH	65,000 AIC 0.011 mH	With Line Impedance of	
kW 400V 50 Hz	hp 460V 60 Hz						3%	5%
			A	A	A	A	A	A
110	—	ATV66C13N4	226	—	238	—	—	—
—	150		180	191*	217	246	182	170
132	—	ATV66C15N4	270	—	278	—	—	—
—	200		240	242*	277	314	238	223
160	—	ATV66C19	330	—	336	—	—	—
160	—	ATV66C23N41	330	—	336	—	—	—
—	250		300	317†	333	379	295	276
200	—		407	—	399	—	—	—
—	300		360	367†	381	443	352	328
220	—	ATV66C28N41	449	—	428	—	—	—
—	350		420	419†	431	506	410	383
250	—	ATV66C31N41	460	—	472	—	—	—
—	400		477	472†	484	571	467	438

[1] 10,000 AIC denoted by asterisk (*).
[2] 18,000 AIC denoted by (†).

Table 14: Input Line Currents for Selecting Branch Circuit Conductors, 460 V VTLN

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power		Drive Controller	Output Current	Input Line Current				
				5,000 AIC 0.141 mH 10,000 AIC [1] 0.070 mH	22,000 AIC 0.032 mH	65,000 AIC 0.011 mH	With Line Impedance of	
kW 400 V 50 Hz	hp 460 V 60 Hz						3%	5%
			A	A	A	A	A	A
0.75	—	ATV66U41N4	2.0	—	4.0	—	—	—
—	1		1.8	2.7	3.2	3.5	1.6	1.5
1.5	—		3.7	—	6.5	—	—	—
—	2		3.4	4.7	5.7	6.4	3.0	2.7
2.2	—		5.3	—	9.0	—	—	—
—	3		4.8	6.5	8.0	8.8	4.2	3.9
3	—	ATV66U54N4	7.1	—	12.0	—	—	—
4	—	ATV66U72N4	9.5	—	15.0	—	—	—
—	5		7.6	9.8	11.9	13.2	6.7	6.2
5.5	—	ATV66U90N4	11.8	—	20.0	—	—	—
—	7.5		11.0	13.9	16.7	18.5	10.0	9.2
7.5	—	ATV66D12N4	16.0	—	26.0	—	—	—
—	10		14.0	17.6	21.4	24.7	13.0	12.0
11	—	ATV66D16N4	22	—	35.0	—	—	—
—	15		21	24.8	29.9	33.6	19.4	17.9
15	—	ATV66D23N4	30	—	45.0	—	—	—
—	20		27	31.9	38.7	44.8	26.0	23.6
22	—	ATV66D33N4	44	—	60.0	—	—	—
—	30		40	44.0	52.4	59.7	37.0	34.2
30	—	ATV66D46N4	60	—	78.0	—	—	—
—	40		52	57.1	67.6	76.6	49.0	45.6
37	—	ATV66D54N4	72	—	94.0	—	—	—
—	50		65	68.3	80.8	91.9	61.2	56.3
45	—	ATV66D64N4	85	—	110	—	—	—
—	60		77	86.4*	94.6	108	71.6	66.7
55	—	ATV66D79N4	105	—	130	—	—	—
—	75		96	106*	116	133	90.1	83.5

[1] 10,000 AIC denoted by asterisk (*).

Table 15: Input Line Currents for Selecting Branch Circuit Conductors, 208-230 V CT

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power 208/230 V 50/60 Hz		Drive Controller	Output Current	Input Line Current						
				208 V	230 V		With Line Impedance of			
				8,800 AIC 0.036 mH	5,000 AIC 0.070 mH	22,000 AIC 0.016 mH	208 V 3%	208 V 5%	230 V 3%	230 V 5%
kW	hp		A	A	A	A	A	A	A	A
0.75	1	ATV66U41M2	4.0	5.7	4.8	5.7	3.5	3.3	3.5	3.0
1.5	2		7.5	10.1	8.6	10.2	6.4	6.2	6.0	5.6
2.2	3		10.6	14.1	11.9	14.1	9.2	8.9	8.5	8.1
4	5	ATV66U72M2	16.7	21.4	18.0	21.5	14.7	14.3	14.0	12.9
5.5	7.5	ATV66U90M2	24.2	30.4	25.6	30.5	22.0	21.3	20.1	19.3
7.5	10	ATV66D12M2	30.8	38.6	32.6	38.7	29.0	27.8	26.5	25.2
11	15	ATV66D16M2	46.2	54.7	46.2	54.8	43.0	41.1	38.7	37.2
15	20	ATV66D23M2	59.4	69.4	58.8	69.5	57.0	54.1	50.4	49.0
20	30	ATV66D33M2	88.0	97.6	81.1	97.6	83.0	79.8	74.0	72.0
30	40	ATV66D46M2	114	124.2	102.1	125.4	109.1	105.4	98.7	95.6

Table 16: Input Line Currents for Selecting Branch Circuit Conductors, 208/230 V VT

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power 208/230 V 50/60 Hz		Drive Controller	Output Current	Input Line Current						
				208 V	230 V		With Line Impedance of			
				8,800 AIC 0.036 mH	5,000 AIC 0.070 mH	22,000 AIC 0.016 mH	208 V 3%	208 V 5%	230 V 3%	230 V 5%
kW	hp		A	A	A	A	A	A	A	A
0.75	1	ATV66U41M2	4.0	5.7	4.9	5.8	3.5	3.3	3.5	3.0
1.5	2		7.5	10.2	8.6	10.2	6.4	6.2	6.0	5.6
2.2	3		10.6	14.0	11.8	14.0	9.2	8.9	8.5	8.1
5.5	7.5	ATV66U72M2	24.2	30.6	25.8	30.6	22.0	21.3	20.1	19.3
7.5	10	ATV66U90M2	30.8	38.8	32.7	38.8	29.0	27.8	26.5	25.2
11	15	ATV66D12M2	46.2	54.7	46.2	54.8	43.0	41.1	38.7	37.2
15	20	ATV66D23M2	59.4	69.3	58.7	69.4	57.0	54.1	50.4	49.0
18.5	25		74.8	84.4	71.5	84.4	69.2	67.2	64.0	60.9
30	40	ATV66D33M2	114	124.9	102.7	125.9	109.1	105.4	98.7	95.6
37	50	ATV66D46M2	143	149.3	122.6	151.1	134.0	129.6	121.0	117.4

Table 17: Input Line Currents for Selecting Branch Circuit Conductors, 208/230 V VTLN

Note: The input conductor ampacity rating should not be less than the ampacity rating selected, based on the rated controller output current.

Motor Power 208/230 V 50/60 Hz		Drive Controller	Output Current	Input Line Current						
				208 V 8,800 AIC 0.036 mH	230 V		With Line Impedance of			
					5,000 AIC 0.070 mH	22,000 AIC 0.016 mH	208 V		230 V	
							3%	5%	3%	5%
kW	hp		A	A	A	A	A	A	A	A
0.75	1	ATV66U41M2	4.0	5.8	5.4	6.4	3.5	3.3	3.5	3.0
1.5	2		7.5	10.4	8.8	10.4	6.4	6.2	6.0	5.6
2.2	3		10.6	14.3	12.0	14.3	9.2	8.9	8.5	8.1
4	5	ATV66U72M2	16.7	21.8	18.3	21.8	14.7	14.3	14.0	12.9
5.5	7.5	ATV66U90M2	24.2	30.6	25.8	30.7	22.0	21.3	20.1	19.3
7.5	10	ATV66D12M2	30.8	38.9	32.8	39.0	29.0	27.8	26.5	25.2
11	15	ATV66D16M2	46.2	55.1	46.5	55.2	43.0	41.1	38.7	37.2
15	20	ATV66D23M2	59.4	70.3	59.6	70.3	57.0	54.1	50.4	49.0
22	30	ATV66D33M2	88.0	97.2	80.8	97.2	83.0	79.8	74.0	72.0
30	40	ATV66D46M2	114	124.2	102.0	125.4	109.1	105.4	98.7	95.6

Control Wiring Precautions

Although all control inputs and outputs of the drive controller are isolated from the input lines, you must follow certain control wiring precautions:

- Keep control wiring conductor runs short and direct. Follow the conduit and circuit separation requirements listed throughout this section.
- Make sure that the control contacts used with the drive controller inputs are rated for operation at open circuit voltages of 24 VDC and closed circuit currents of 10 mADC.
- Analog inputs and outputs require twisted cable with a pitch of 1 to 2 inches. Use of a cable shield is recommended. The shield must be terminated to ground at one end only. It is recommended that the shield be terminated at the drive controller. Shield connection terminals are provided on the ALTIVAR 66 drive controller for this purpose.
- Make sure that the coils of all relays and solenoids connected to the output contacts of the drive controller are equipped with appropriate transient suppressors.
- For proper control wiring, route conductors to avoid contact with other voltage potentials in the drive controller. Wire insulation must have the appropriate voltage rating for the voltage present. The ATV66C10N4 to C31N41 drive controllers are equipped with control wiring channels to

allow routing of control conductors away from power circuit conductors. The channels are located on the right side of ATV66C10N4 to C19N4 controllers, and on the left side of ATV66C23N41 to C31N41 controllers.

Output Wiring Precautions

⚠ WARNING

DRIVE CONTROLLER DAMAGE

Drive controller will be damaged if input line voltage is applied to output terminals (U/T1, V/T2, W/T3). Check power connections before energizing drive controller.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The drive controller is sensitive to the amount of capacitance (either phase-to-phase or phase-to-ground) present on the output power conductors. If excessive capacitance is present, the drive controller may trip. Follow the guidelines below when selecting output cable:

- Cable type: the cable selected must have a low capacitance phase-to-phase and to ground. Do not use mineral impregnated cable because it has a very high capacitance. Immersion of cables in water increases capacitance.
- Cable length: the longer the cable, the greater the capacitance. Cable lengths greater than 320 ft (100 m) may require analysis to determine if mitigation is required. Contact your local ALTIVAR representative.
- Proximity to output cables from other drive controllers: because of the high frequency switching and increased capacitance, the drive may fault under some conditions.
- Do not use lightning arrestors or power factor correction capacitors on output of drive controller.

For installation where cable capacitances may be a problem, an inductor can be installed between the drive controller and the motor. See catalog or consult factory for additional information.

⚠ CAUTION

DRIVE CONTROLLER SWITCH FAILURE

For proper drive controller electronic short circuit protection, inductance is required in the output power wiring. Provide at least 48 in (122 cm) of cable at the drive controller output (U/T1, V/T2, W/T3).

Failure to follow these instructions can result in equipment damage.